The Effects of Algo-Heuristic Lesson Design on Creative Thinking, Creative Strengths and Achievement of Visual Art Subject

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Abstract

The purpose of this study is to investigate the effect of algo-heuristic lesson design on creative thinking, creative strengths and achievement of students in visual art subject. The research method used in this study was the quasi-experimental method. It was divided into two groups; treatment group and control group. The treatment group applied the algo-heuristic lesson design method and control group used the expository lesson design method. Both groups used the same multimedia courseware but with different methods of teaching. The findings indicate that the algo-heuristic lesson design method significantly improved creative thinking skills, creative strengths and artwork quality among Form Four students in visual art subject. The significant implication of this study was the algo-heuristic lesson design method had enhanced students' creative thinking, creative strengths and achievement in artwork quality compared to students who were taught using the expository lesson design method.

Keywords: Creative Thinking, Creative Strengths And Achievement, Algo-Heuristic Lesson Design Method And Expository Lesson Design Method

Introduction

The visual art subject is integrated within the Curriculum for secondary school as an elective subject for Form Four and Form Five students. The purpose of the visual art subject is to give students the opportunity to apply their artwork which combines elements of design with a variety of techniques. The process to produce artwork is emphasised more to creation of ideas which are related to personality traits, community values and country values, rather than for science and technology achievement and development.

The syllabus for visual art subject includes elements of design, principles of design, fine art (drawing, painting, sculpture and printing), visual communication (graphic and

multimedia), design (industrial design and environmental design: landscape and interior design) and traditional craft and new dimensional design (Ministry Of Education, 1995).

In the visual art lesson syllabus, the styles of art consist of ten categories such as realism, impressionism, expressionism, cubism, surrealism, pop art, op art, conceptual art, minimal art and abstract expressionism. In fact, there are a lot of art styles in art fields such as neoclassicism, romanticism, naturalism, post impressionism, symbolism, futurism, Dadaism, regionalism, fauvism and others (Ocvirk et al, 1994). So in this situation, students should be able to have knowledge and understanding of this topic of interest. If they are unable to have knowledge and an understanding of this topic, they will be confronted with problems in creating ideas in their artworks, for instance painting, sculpture, drawing and printmaking.

In this study, the algo-heuristic lesson design will be applied and carried out in order to enhance, foster and identify students' creative thinking and creative strengths in learning visual art subject. The algo-heuristic lesson design is very useful and need to be used. The algo-heuristic lesson design is a viable technique and the students will become more creative (Landa, 1975). Hence, learning about visual art will give students a window onto the rich and interesting world around them, teaching them about their own history and culture and to cultivate self-expression, imagination and creativity. Students who learn about art will develop their capacities to weigh meanings, make evaluations and judgement, work cooperatively in groups, work hard to achieve goals, and learn to analyse, to judge the meanings of images and to communicate their own ideas. Art is very important in daily life, but not everybody realises this fact. Most people claimed that art cannot develop and enhance any thinking ability. Art can also integrate the mind, body and spirit.

Art is an opportunity for processing experience from the beginning to the end. It also provides immediate feedback and opportunities for reflection. Art is using of personal strengths in meaningful ways and to bridge an understanding and also to merge the learning process and content. Furthermore, it improves academic achievement such as enhancing test scores, attitudes, social skills, critical and creative thinking. Art is an exercise that enables the development of higher order thinking skills including analysis, synthesis, evaluation, and problem-solving. It is an essential component of any alternative assessment programme and also provides the means for students to learn (Dickson, 1993). Hence, art is very important in our lives because it is one of the requirements in making life more ideal and meaningful. Furthermore, art is able to stimulate creative thinking of new ideas and sophisticated creations, as well as the development of ideas and personality traits.

The main problems encountered in this teaching practice are the inefficiency of teaching and learning process in the visual art class. Moreover, creative thinking has not been taught directly to students and the method used by most teachers was teacher-centred rather than student-centred. The inefficiency of the teaching and learning process in visual art is the major contribution to students' weakness in expressing genuine creations and their inability to think creatively to produce great artwork. In the teaching and learning of visual art, students are not directly taught to think creatively. They actually learn to think creatively without realising it. The students can only learn how to produce creative ideas but not the process on how to think creatively.

Standard of living is another factor that affects the creative thinking process.The students' creative thinking abilities are related to family income, school location and students' nationality (Al-Sulaiman, Norah Ibrahim.1998). There are a lot of differences between students who live in urban and rural areas, for instance in factors involving technological development, the level of thinking, environment and facilities. Students, who live in urban areas, are more exposed to the latest technological development, high level thinking, new and sophisticated environment and facilities. On the other hand, students who live in rural areas encountered a lot of problems such as lack of technological development, high level thinking, facilities and a non-supportive environment. Consequently, environmental factors affect the people's way of thinking, particularly in thinking more creatively, imaginatively and artistically. Creative thinking is the action to create something new and original (Costa, 1985). Hence, creative thinking is very significant to people in order to generate the new ideas and make new improvements in life.

Multimedia is one of the vital tools in teaching in visual art subject. In this study, students are not exposed into using technology due to lack of facilities. There are lots of multimedia tools that can be used in the teaching and learning process, for instance through the web, interactive courseware, video presentations, and animation. The current problem that occurs in teaching and learning of visual art subject is that students are not enlightened with multimedia facilities. Hence, the students will have problems in think creatively because they are not exposed to up-to-date technology in order to generate new and creative ideas to construct great artwork.

Literature Review
The Algo-Heuristic Theory Of Instruction.
The Landa's theory tends to emphasise the macro strategies of selection and sequencing of the instructional content. The most important features in his theory calls for the breaking down of the complexity with respect to selection, then the instructional content will result in the "elementary" cognitive operations and snowball method to complete the cognitive process (Landa, 1976).

The snowball method is one of the significant processes in the algo-heuristic lesson design. In this study, the students will learn the history of art and art styles topics which includes realism, expressionism, impressionism, abstract expressionism, surrealism, pop art, op art, minimal art, cubism, and conceptual art. Before they learn about the history of art and styles of art, the students already have had prior knowledge such as the elements and principles of art. The elements of art includes line, space, form, colour, texture and shape, and the principles of art are harmony, proportion, contra, dominance, rhythm and movement, unity and variety (Ocvirk et al., 1994). This prior knowledge is very vital for students to ensure that they can apply this knowledge into their artwork.

The snowball methods are very important in the learning process of student algorithm, task algorithm and teacher algorithm. In this study, the snowball method will be utilised in interactive courseware as teaching method. The student algorithm in this study is quiz questions. The students will answer the quiz questions after they have completed reading about one of art styles. The snowball process will occur when the students answer the quiz questions. If the students can answer the quiz, they will go to the next task in which they have

to do the sketches and continue with final artwork about the same topic. But the students cannot go to the next topic if they cannot answer the quiz questions, therefore they should go back and repeat the quiz. Landa (1976) mentioned that the algo-heuristic theories of instruction in Landa's theories have their own basic concepts with different objectives, for instance to equip students with knowledge about certain phenomena, to develop the skills to handle these phenomena and to form students' abilities, motives and personality traits. The outcome should be a specific psychological phenomenon.

Landa mentioned that, there are relationships between learning, performance and instruction. Landa stated that the algorithm-heuristic theory of learning and performance will play a role to create more understanding and to describe a specific process that include operations and their system which turn knowledge into skills and abilities, underlie the latter and the performances that realise them and allow a person not just to know something but apply this knowledge to solve problems and performing certain activities, in motor or cognitive process (Landa, 1976).

Landa (1976) also stated that, there are two processes consisting of a series of relatively elementary and non-elementary operations carried out to perform in different ways such as an algorithm process and a heuristic process. The algorithm process is performed in some regular, uniformed way under defined conditions to solve a problem in certain class. The prescription determining these operations are an algorithmic prescription or an algorithm. In contrast, in the heuristic process, a series of none elementary operations are performed in a regular or uniform way under the same conditions and a prescription of these operations is a heuristic prescription.

Landa (1976) represented that algo-heuristic prescription as means of increasing the efficiency of instruction that is important to distinguish between three types of prescriptions such as prescriptions for performers, learners and teachers. Furthermore, he also proposed the paradigm of learning such as input, process, output and feedback. Hence, the schema theory will be applied through the algo-heuristic lesson design to construct the learning process to be more effective, efficient and constructive. The two effects which include accretion and tuning will be applied throughout the process of learning in the algo-heuristic lesson design. The accretion effect is applied to the intermediate level of students, to obtain new information and locate or add the information based on the existing memory. After that, the students must comprehend that information. The tuning effects will create new information that will be an amendment from the existing schema. The tuning effects are aimed towards the slowest form of learning (Rumelhart and Norman, 1978).

Snowball, Schema Theory and Creativity
In this study, the combination of snowball, schema theory and creativity are very vital to identify the effect of the algo-heuristic lesson design in creative thinking, creative strengths and achievement of Form Four students in visual art subject. The snowball method is to help students internalise their thought processes and to understand the steps they should go through when learning something new (Reigeluth, 1999). Furthermore, it helps students to develop creative thinking skills. Then students can transfer their knowledge to produce great artwork. Landa (1976) explained that after sufficient practice of the algorithm processes, it would become an automatic and unconscious application.

Knowledge with structure is called schema theory which accommodates mental process (Danielson, 1999). He also proposed that schema theory provide a context for interpreting new knowledge with structure to hold it. The important aspect of interpretation is creativity and they also mentioned that creativity helps to enhance understanding the meaning of the visual (Couch, Caropreso, & Miller, 1994). The combination of the snowball method, schema theory and creativity will make the learning process more useful, interesting and effective. The snowball method occurs when the process of learning starts by using multimedia courseware. The students will do the task and will continue by answering the quizzes. If they failed to answer, they must go back to the task and redo the quizzes. If they succeed, they proceed to the next task. So, the snowball effect is applied in this lesson.

The schema theory will be applied after students are successful in answering all the quizzes, and afterwards proceed to next task. The accretion effect will occur at this stage. New ideas will be constructed with knowledge gained from the theory. After they identify the knowledge on the topic of interest, they will do some sketches. The tuning effect develops when they do the sketches. After they have generated the ideas, it will be applied through the sketches. The ideas from the knowledge they have gained will be applied and modified in the sketches. After they have finished doing the sketches, they will go to the next step. They will carry out one artwork with ideas to generate and create new ideas. This situation is called the restructuring effect. Thus, creativity will occur when they have completed their artwork.

Expository Method
In this study, there are two methods will be used that consist of the algo-heuristic method as the guided method and the expository method. The expository method is also by Landamatics which involves the same step as the guided method, but the difference is that students are allowed to decide which lesson they would like to learn in the interactive courseware (Landa, 1999). The expository method will be applied in this study to construct the similarity between expository method and algo-heuristic method in order to seek out the effect of the algo-heuristic lesson design on creative thinking and achievement of Form Four students in visual art subject.

Torrance Test Creative Thinking
In this study, Torrance Test Creative of Thinking is very significant to measure the creative thinking and achievement of form four visual art students in secondary school. The Torrance Test of Creative Thinking was developed by Torrance in 1966 and has been reformed four times in 1974, 1984, 1990 and 1998 (Cramond, 2002). Torrance has mentioned that the purpose of Torrance Test of Creative Thinking is to comprehend the performance and development of human mind, to determine valuable bases for individualising instruction, to evaluate the effects of educational programs, materials, curricula and teaching procedures and so forth (Torrance, 1974). Torrance also proposed that the main purpose of Torrance Test of Creative Thinking is for research and experimentation, for general use of instructional planning and to determine possible strengths of students.

In this study, Torrance Test of Creative Thinking is carried out in order to test the visual art Form Four students' ability in thinking creatively through drawing. The Torrance Test of Creative Thinking has two types of test form, for instance TTCT-figural and TTCT-verbal. But in this study, only the TTCT-figural is used in which it has two parallel forms that are booklet

A and booklet B. This TTCT-figural consists of three activities such as picture construction, picture completion and repeated figures of lines or circles (Torrance, 1966, 1974, 1984, 1990, 1998). According to Torrance, there are thirteen criterion-referenced that have to be measured, called creative strengths. The score from the artwork production will be check-listed and the results of creative strengths of students displayed. The creative strengths include emotional expressiveness, storytelling articulateness, movement of action, expressiveness of titles, synthesis of incomplete figures, synthesis of lines, synthesis of circles, unusual visualisation, internal visualisation, extending or breaking boundaries, humour, richness of imagery, colourfulness of imagery and fantasy.

Research Objectives
The main objective of this research is to identify:
The effect of the algo-heuristic lesson design on creative thinking, creative strengths and achievement of Form Four students in visual art lesson.

Research Methodology
According to Torrance, many researchers used the Torrance Test of Creative Thinking to test for computer science subjects, mathematics subjects, and art subjects only for kindergarten students and science subjects; however creative thinking has not been measured in visual art subject for secondary school up till now. So, it is very significant to identify secondary school students creative thinking to construct magnificent ideas and artwork. The independent variable of the study is the algo-heuristic lesson design and the dependent variable is on creative thinking and creative strengths. The creative thinking and creative strengths have been measured by the pre-test and post-test scores. The sample consisted of 60 participants of Form Four visual art subjects in secondary school. Randomly, one of the classes received the interactive courseware by the algo-heuristic lesson design method and other class also received the same content of multimedia courseware but using the expository lesson design method.

Data Analysis
The purpose of the study is to analyse the effect of algo-heuristic lesson design in creative thinking, creative strengths and achievement of Form Four students in visual art lesson. The data had been analysed by using one way ANOVA test to gain the score in creative thinking, achievement and creative strengths. However, the creative strengths are the descriptive structures and had been check listed after they completed their artwork. The data in univariate analysis of variance had been analysed between-subject factors of the algo-heuristic lesson design method and the expository lesson design method. The data of descriptive statistics and tests between-subjects effects had been analysed in pre-test of creative thinking figural form A, post-test of creative thinking figural form B, SPM and creative strengths. These were the dependent variables between the groups of the algo-heuristic lesson design method and the expository lesson design method.

Tests for Group Equivalence
H1 Based on the algo-heuristic lesson design method, students will achieve the highest mean score significantly in creative thinking compared to students taught using the expository lesson design method. The results in this study showed that the algo-heuristic lesson design method group reported a mean score of 48.87 with a standard deviation of 29.12 and the

expository lesson design method group reported a mean score of 30.81 with a standard deviation of 12.85 (Table 1). The ANOVA test result reported F (1, 59) =9.93 at p=0.003. As p<0.05, H1 is accepted. The finding indicates that the algo-heuristic lesson design method significantly improved creative thinking skills among students.

Table 1
Means, Standard Deviations and Results of ANOVA for Creative Thinking Scores

Treatment	Means	Standard Dev	n	p
Algo-H	**48.8667**	**29.12012**	**30**	**F(1,59)=9.93**
Expository	**30.8065**	**12.84892**	**31**	**=0.003**
				(Adjusted R squared= 0.799)

H2   Based on the algo-heuristic lesson design method, students will produce significantly better artwork compared to students taught using the expository lesson design method. The results in this study showed that the algo-heuristic lesson design method group reported a mean score of 738.63 with a standard deviation of 92.56 and the expository lesson design method group reported a mean score of 558.51with a standard deviation 110.48 (Table 2). The ANOVA test result reported F (1, 58) =33.048 at p=0.00. As p<0.05, H1 is accepted. The finding indicates that the algo-heuristic lesson design method significantly improved artwork quality among students.

Table 2
Means, Standard Deviations and Results of ANOVA for Artwork Scores

Treatment	means	Standard Dev	n	7	p
Algo-H	738.63	92.56	30	9	F(1,58)=33.048
Expository	558.51	110.48	31	11	p=0.00
				12	(Adjusted R squared= 0.470)

H3   Based on the algo-heuristic lesson design method, students will achieve the highest mean score significantly in creative strengths compared to students taught using the expository lesson design method. The results in this study showed that the algo-heuristic lesson design method group reported a mean score of 11.90 with a standard deviation of 1.73 and the expository lesson design method group reported a mean score of 10.52 with a standard deviation 2.20 (Table 3). The ANOVA test result reported F(1,58)=4.479 at p=0.039. As p<0.05, H3 is accepted. The finding indicates that the algo heuristic lesson design method significantly improved creative strengths among students.

Table 3
Means, Standard Deviations and Results of ANOVA for Creative Strength Scores

Treatment	Means	Standard Dev	n	p
Algo-H	11.90	1.73	30	$F_{(1,58)}=4.479$
Expository	10.52	2.20	31	p=0.039
				(Adjusted R squared= 0.099)

Summary
The findings indicate that the algo-heuristic lesson design method significantly improved
1.   Creative thinking skills among students.
2.   Artwork quality among students, and
3.   Creative strengths among students.

Suggestion for Further Research
On the basis of the success of this study I make the following recommendations that creative thinking should be applied in visual art subject for secondary schools in order to nurture students' creative thinking and their ability to create, construct and produce significant artwork. It also highly recommended in the educational field and most widely used test of creativity (Colangelo & Davis, 1997). The algo-heuristic lesson design method should be applied in teaching and learning process on visual art lesson in order to improve students' creative thinking and produce unlimited artwork. The learning process must be student-centred rather than teacher-centred.   Students in rural areas should be exposed to technological development and be provided with facilities to improve their level of thinking. However, multimedia facilities should be provided in visual art lesson as to make the lessons more attractive and effective. The Torrance Test of Creative Thinking figural form A and the Torrance Test of Creative Thinking figural form B should be applied in visual art lesson to measure students' creative thinking. Colangelo & Davis (1997) stated that Torrance Test of Creative Thinking is for the development of evaluation. So, this test is very vital for the development of creative thinking in secondary schools.

Conclusion
This study indicated that there is a significant difference in the creative thinking of students taught in the algo-heuristic lesson design compared to students taught using the expository method; there is a significant difference in the achievement of students taught in algo-heuristic lesson design compared to students taught using the expository method; and there is a significant difference in the creative strengths of students taught in the algo-heuristic lesson design compared to students taught using the expository method.
Thus, the algo-heuristic lesson design goal is the mastery and also the command of general method of thinking and intelligence (Landa, 1983). Overall, we conclude that the algo-heuristic lesson design is the effective, useful and systematic method that was applied in this study. The algo-heuristic lesson design encouraged students to develop new ideas, sophisticated idea creation, idea development and also personality traits development. In

contrast, students in the expository lesson design method were free to negotiate their own delegations of responsibilities and encouraged to generate ideas in a playful manner. The method that was chosen by the expository lesson design was not entirely successful. Hence, it was concluded that, the algo-heuristic lesson design is the best method to apply in visual arts subject. The data presented that students of the algo-heuristic lesson design method performed better than students of the expository lesson design method.

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